



# INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT



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ISSN: 2226-6348

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To Link this Article: <http://dx.doi.org/10.6007/IJARPED/v2-i4/467>

DOI: 10.6007/IJARPED/v2-i4/467

**Received:** 15 June 2013, **Revised:** 16 July 2013, **Accepted:** 12 August 2013

**Published Online:** 29 September 2013

**In-Text Citation:** (Udoh & Okoro, 2013)

**To Cite this Article:** Udoh, N. A., & Okoro, C. C. (2013). Developmental Dyspraxia—Implications for the Child, Family and School. *International Journal of Academic Research in Progressive Education and Development*, 2(4), 208–224.

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Vol. 2(4) 2013, Pg. 208 - 224

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## Developmental Dyspraxia—Implications for the Child, Family and School

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### Abstract

This article is a synthesis of current literacy on developmental dyspraxia and aims to alert experts in education from the early-childhood level to the implications of dyspraxia for the child, the family, and the school. The paper posits a clear definition of dyspraxia and clearly identifies common signs and symptoms of dyspraxia. The paper further gives educators specific pointers to the incidence of dyspraxia in preschool and school-age children for effective diagnosis and psychoacademic intervention. The physical, intellectual, emotional, social, language and, sensory implications of dyspraxia for the child, the family and the school is exhaustively discussed. The authors finally reviewed extensively current directions in helping dyspraxic children. Based on the review, the authors conclude that the duty lies heavily on psychoacademics in the school system to identify and address cases of dyspraxia at the earliest onset. The authors recommended, inter alia, that school counsellors employ a tailor-made programme of career education for the dyspraxic as this impairment can seriously interfere with their vocational development.

**Keywords:** Dyspraxia, Adjustment Counselling, Learning Difficulty, Dyspraxic Children

### Introduction

Developmental Dyspraxia has been recognized by doctors and therapists since early 20th century. Since then it has been described and labelled by many, such as Anna Jean Ayres, who in 1972 called it a disorder of sensory integration (Ayres, 1972), and Dr Sasson Gubbay who in 1975 called it the 'Clumsy Child Syndrome' (Gubbay, 1978). Other labels have included developmental awkwardness, sensorimotor dysfunction, minimal brain dysfunction, motor sequencing disorder, and most recently developmental coordination disorder (DCD). The World Health Organization currently lists it as specific developmental disorder of motor function (Medical News Today, 2013; National Institute of Neurological Disorders and Stroke [NINDS], 2011; Henderson & Henderson, 2003; Gibbs et al., 2007; Gillberg & Kadesjö, 2003; Willoughby & Polatajko, 1995). Gradually over the years professionals have become increasingly able to sift out the symptoms and more closely identify the disorder. Some authors have argued that developmental dyspraxia

should be distinguished from apraxia and developmental coordination disorder, stating that apraxia and dyspraxia primarily refer to the problems of motor sequencing and selection, which not all children with DCD exhibit (Miyahara & Möbs, 1995). Currently, however, the fifth revision of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) classifies dyspraxia, as a motor disorder, in the category of neurodevelopmental disorders (American Psychiatric Association, 2013).

Whatever it is called, developmental dyspraxia (hereinafter referred to as dyspraxia) causes disruptions of major proportions in the lives of those whom it afflicts and of their families and the world around them. It therefore becomes imperative for educators especially those in early childhood education, to be well informed of the incidence of this intellectual impairment as intended by this systematic review. Moreover, this paper attempts to bring clearly to the fore, not only the bio-psycho-social implications of dyspraxia but also its implications for the child, the family wherein the child finds him/herself, and the child's academic endeavours.

### **Defining Dyspraxia**

Dyspraxia is generally recognized to be an impairment of the organization of movement (praxis); as a result of brain messages not being accurately transmitted to the body (Dyspraxia Foundation, 2013; Polatajko, Fox, & Missiuna, 1995). Associated with this may be problems of language, perception and thought. It is a neurologically based disorder of the processes involved in praxis or the planning of movement to achieve a predetermined idea or purpose, which may affect the acquisition of new skills and the execution of those already learned. More specifically, it is a disorder of praxis, or the process of ideation (forming an idea of using a known movement to achieve a planned purpose), motor planning (planning the action needed to achieve the idea), and execution (carrying out the planned movement)—Barnhart et al., 2003; Blank et al., 2012; Zwicker et al., 2012; Henderson & Henderson, 2003; Gibbs et al., 2007; Kirby & Sugden, 2007; Magalhães et al., 2006).

Dyspraxia may be regarded as a hidden handicap because, under normal circumstances, children with dyspraxia may appear no different from other children, until new skills are tried or known ones taken out of context, when difficulties may become apparent. In most cases, dyspraxia occurs with or as part of other neurological conditions so that defining common symptoms may be confusing. Therefore a diagnosis, naming the disorder, is often very difficult, and sometimes the closest may be 'shows some dyspraxic tendencies'.

Dyspraxia may affect any or all areas of development—physical, intellectual, emotional, social, language, and sensory—and may impair the normal process of learning. It is not a unitary disorder (like measles or chicken pox, where all those affected share a common set of symptoms), and affects each person in different ways at different ages and stages of development, and to different degrees. It is inconsistent, in that it may affect the child one day but not the next - as if sometimes information is 'put away in the wrong drawer' - and it may affect children in different ways at different ages and developmental stages. Noteworthy too is the fact that dyspraxia may persist through the lifespan (Kirby et al., 2010)

According to the National Centre for Learning Disabilities (NCLD, 2013), dyspraxia can affect numerous functions required for basic tasks of daily living as categorized in the table below:

<b>Category</b>	<b>May Cause Troubles With</b>
Ideomotor Dyspraxia	Completing single-step motor tasks such as combing hair and waving goodbye.
Ideational Dyspraxia	Multi-step tasks like brushing teeth, making a bed, putting clothes on in order, as well as buttoning and buckling
Oromotor Dyspraxia	Coordinating the muscle movements needed to pronounce words
Constructional Dyspraxia	Establishing spatial relationships, for instance, being able to accurately position or move objects from one place to another

### **Aetiology and Incidence of Dyspraxia**

The pre-birth growth and development of the baby follows a set pattern and time-frame (The Cleveland Clinic Foundation [CCF], 2010). At conception the fertilized egg begins to multiply; very soon some separate from the rest and, taking a unique form, continue to multiply at their own increased rate, as the nerve cells (neurons) of the brain. By about six months gestation (3 months before birth) the full complement of neurons, with their axons, has been produced; after that time no further new neurons are grown. They do not regenerate, so a neuron which is damaged or dies, or does not complete its growth (and reach its destination) in time, will not be replaced or renewed, as are cells in other parts of the body. Thus, if a cell or group of cells, fails to complete its growth and reach its destination within the time-frame, future sensory information from that area will be impaired (Newman & Newman, 2012).

Development which does continue to occur (and does so until old age) is that of the individual cells, as they grow dendrites and connections within the brain. There are billions of neurons in every brain, each with very many connections with other cells. For correct functioning, neurons have to have developed in sufficient numbers in the right areas of the brain, extending to the correct destination, by the appropriate time or they never will (Drachman, 2005). There are two kinds of neurons - those carrying messages to the brain (sensory) and those carrying messages from the brain (motor).

At about 3 months before birth the axons begin to develop an insulating fatty sheath called myelin; this allows messages to be efficiently carried along them - a bit like insulating an electric wire, without it the messages or impulses may scatter everywhere, with it they are concentrated, focused and aimed at the right destination (Hartline, 2008). This sheath is in place by around 3 months of age; babies younger than that can be observed to make random reactive movements, without purposeful intent. After myelination movements may achieve a purpose, eyes may become more focused, and the baby may recognize or touch a face and smile.

The connections between nerve cells (dendrites and synapses) continue to increase throughout one's lifetime; their growth stimulated by the demands of the environment, and as learning takes place. The brain consists of neurons, connected (by nerve fibres or axons) to their various destinations in the body, and arranged in convoluted lobes in two halves or hemispheres. Each hemisphere is also divided into lobes - the Frontal, Parietal, Temporal, and Occipital lobes. The Limbic System is among other things the emotional centre of the brain. Different functions of the body are controlled by different parts of the brain. "Messages" and information travel along

nerve fibres by way of the Spinal Cord, Cortex, Cerebellum and the Corpus Callosum. Incoming information from the senses - touch, taste, sight, smell, hearing, movement, balance, warmth, word, life, self - is organized and stored in the brain, to be retrieved for use as it is needed.

It is reported by some experts that 10%—20% of the general population have some degree of dyspraxia, with 2% of the cases being severe, 6% being children aged 5-11, and four-fifth of sufferers being male. Another report further asserts that in a classroom of 30 students, for example, one is probably dyspraxic (Dawn, 2005; Medical News Today, 2013; Barnhart, Davenport, Epps & Nordquist, 2003; Zwicker et al., 2012; Henderson & Henderson, 2003; Robin et al., 2008).

Dyspraxia is often comorbid with dyslexia (trouble reading, writing and spelling) dyscalculia (trouble with mathematics), and other conditions that impact learning, such as Attention-Deficit/Hyperactivity Disorder (ADHD). Symptoms of these may be similar but general, the problems caused by this developmental disorder is often worsened by resultant weaknesses in comprehension, information processing and listening; this in turn may lead to low self-esteem, depression and other emotional cum behavioural deficits (NCLD, 2013). Moreover, although persons with dyspraxia may be of average or above average intelligence, they may often behave immaturely (NINDS, 2011).

### **Understanding Praxis**

The cerebral cortex of the human brain can be divided into four distinctive areas. These are; the motor area, the frontal lobe, the sensory area and the hind cerebral cortex. Impulses from sensory organs are relayed to the cerebral cortex by means of a network of pathways of nerve fibres. In the course of growing and learning, the connections between the nerve cells (neural pathways) become established. They are reinforced when the desired outcomes are achieved—for example, a child learning to process the complex series of movements required in picking up a cup to drink from it. Constant repetition allows the planning of these actions to become almost reflexive (Kendra, 2013). Using external sensory input such as sight and sound, together with these 'learned' patterns of movement, the cerebral cortex is able to judge the best course of action to take. It then sends out the appropriate motor impulses. The cerebral cortex is divided into a right and left hemisphere, each with specialised, but often, shared functions. With dyspraxic individuals, both hemispheres fail to share such functions, they fail to work in a co-ordinated fashion. It is also the development of the two hemispheres that decides whether a person is right or left handed, thus in dyspraxic individuals, this basic development seems substantially reduced and therefore the child may use both hands without preference for some time, thus reducing the development of hand-writing skills still further (Dyspraxia Foundation, 2013).

Praxis is the skill or process that makes us human, the link between brain and behaviour; it allows us to make choices, to plan our lives and our actions. With it we can function in our physical world, dress ourselves, eat with utensils, play, write, build, and change our environment to meet a purposeful goal. To do these things, one first needs the idea of doing them (ideation), then to know how to do them (motor planning), and then be able to perform the actions (execution). That is Praxis - the ability to organize our activities in new and creative ways, not automatically.



### **Ideation**

When we meet a new activity, like a set of blocks, for the first time, we must first explore them, gathering sensory information about them - how they feel, taste, look and smell, what shape they are and how that feels and looks, how much space that shape takes up, what the weight feels like, are they hard or soft, strong enough to support each other, do they stay put or roll, balance, what we can make them do, etc. When all that information and experience has been explored, and sorted and stored in our brains, then (if the frontal lobe of the brain is sufficiently well developed) we may retrieve and use the knowledge of that experience to form the idea of using the blocks to achieve a purpose - like a road or a bridge. To be able to achieve this, a plan of action is needed.

### **Motor Planning**

The motor planning area in the parietal lobe of the brain, having received the idea, must work out and plan the positions of the body, which arm and leg muscles must contract or relax, in what sequence and how much, how delicately the finger muscles must move and in which direction. To work this out it needs to recall sensory information about our past experience with the blocks - feel, weight, size, balance, length, space, about the floor, the blocks, and about ourselves. It also has to plan the sequence in which the muscles are to work, how still the rest of the body must stay, etc. When this plan is made, messages are sent out for action.

### **Execution**

Muscles can only contract or relax, and for each muscle there are nerve fibres bringing messages from the brain telling it which to do, for how long, and in what sequence, (and sending messages to the brain from the muscle with sensory information to monitor the action). When the motor plan has been made, messages are sent first to each part of the brain, and then to all the muscles to tell them what to do to carry out (or execute) the actions.

Everything is interdependent. Ideation, motor planning, and execution are each dependant on accurately recalling the neurological knowledge (or 'gnosis') gained from experience and sensory information. (In other words, we can't get the idea, plan the movements, or execute them unless we know from past experiences that we can.) And all are dependent on messages traveling the right pathways and making the right connections.

Praxis develops, just as other skills develop. It does not build or add up like blocks. Praxis at 2 years is not a miniature version of Praxis at 5 years; it is rather a new version (because more connections have been made and used in the brain), enabling more actions of increasingly better quality, and allowing for more complicated and refined plans of action to be made.

An infant developing normally begins by making random, uncontrolled movements, arms and legs waving without intent or purpose. Gradually he learns to lift his head, roll over, reach for a toy; when these actions are controlled by his will and done with a premeditated purpose - to see mother or to hold the toy - some motor planning, and early Praxis, has been involved. The action is not reflexive, random, accidental, or automatic. When a child learns to talk, he has to organize a specific set of muscles (the oro-facial and breathing muscles) to produce the right controlled set of sounds in the right sequence at the appropriate time, to match a word pattern he knows, and to achieve a planned purpose. To use language, he has to have the ability to organize his

thoughts, has to have the retrievable memory of the sequence of movement of those muscles, and the meaning of the sound-pattern it produces, so that he can repeat it. This is Praxis.

### **Understanding Dyspraxia**

Dyspraxia is a disorder of Praxis, where somewhere between sensory information gathering and storing, ideation, motor planning, and execution, the messages are not getting through, are not producing the right result. Maybe the information from the senses was not collected, transmitted, or sorted and stored properly, or stored in the wrong place, or not found, or even used but then returned to the wrong storage area; or maybe the motor plan was incomplete or unable to be made, or did not connect with the right nerve fibres or muscles for execution. Whatever it is, Praxis is inconsistently failing. Inconsistently, because yesterday or this morning the messages may have been getting through, the needed information retrieved, and the child may have been able to perform the task, but now he can't, now the plan has been lost somewhere. It may turn up again at another time or the child may have to relearn the plan, skill, or task.

Because of the multiple nature of Praxis, there are a vast number of possible sites of malfunction. It is not known at which point along the 'practic chain' the malfunction(s) occur - it could be anywhere from sensory information collection and storage to execution of actions.

Dyspraxia is not an illness or disease from which one can recover, but a neurologically based disorder which one gets 'around', not 'over'. It is not a 'unitary' disorder. (Unitary means a disorder where there is a specific set of symptoms common to each case, like measles or chicken pox.) Each child is affected in different ways, and to different degrees. It is possible for a child who is affected in one developmental area to show symptoms in another area later, according to developmental demands. Or several different sets of symptoms may be present from the start. It may occur in isolation or (as is frequently, the case) as part of another disorder. Skills learned in one context may not be able to be transferred to a new context, and need to be learnt anew, a point which shows clearly as the child moves to a new developmental stage.

Developmental dyspraxia is different from acquired dyspraxia in that there is no memory of praxis for the system to recall. As treatment is given and praxis learnt, it builds developmentally, increasing the amount and quality of actions, the brain affected in developmental dyspraxia is immature, whereas that in acquired dyspraxia has already matured, so children with developmental dyspraxia have no neurological memory of praxis to work towards.

### **Major Causes of Dyspraxia**

It is believed that factors such as illness or trauma may adversely affect normal brain development, resulting in dyspraxia. Also, genes may play a role in the development of dyspraxia. Moreover, dyspraxia may be acquired (acquired dyspraxia) due to brain damage suffered as a result of stroke, an accident, or other trauma (Dawn, 2005). Dyspraxia is not the result of poor physical strength, impaired primary sensation, delayed development, body deformity, or anything that would show up on normal neurological examination. It can be acquired through damage to the brain from a stroke, an accident, or medical disaster to the brain. These people are often older, and have a neurological memory of praxis to work towards. However, damage acquired at an early age may also impair the normal course of development, and thus be

developmental. Developmental Dyspraxia occurs from birth or an early age, thus affecting the normal development of the child, and its causes are not obvious. There may be an inherited tendency towards similar neurological disorders.

There may have been a glitch of some kind (illness, slight trauma, momentary lack of oxygen, etc.) at the crucial developmental time or at birth which caused damage to some cells. It may be that the growth of the dendrites or the connections - synapses and neurotransmitters - which connect the cells is at fault. It may be a matter of which cells, and how many, failed to grow and develop enough to reach their destination at the right time before birth. It often co-exists with other disorders (e.g. mild Cerebral Palsy, Dyslexia, Attention Deficit Disorder, etc.) This fact also makes diagnosis difficult, as symptoms intermingle or are shared by more than one disorder. The gathering, sorting, and storing of sensory information may be faulty. Or the cause may remain completely unknown. In other words, very little is known of the causes, despite considerable research over the years.

### **Signs and Symptoms of Dyspraxia**

Dyspraxia results in poor balance, difficulties in fine and gross motor coordination, problems with vision, motor planning and perception, tactile dysfunction, poor awareness of body position, difficulty with reading, writing and speech, poor social skills and emotional or behavioural problems.

Common symptoms of dyspraxia include:

- Clumsiness, uncoordinated movements;
- Proneness to accidents, may fall a lot, bump into furniture;
- Poor hand-eye, foot-eye coordination;
- Slow and poor at dressing, unable to tie shoelaces, do up buttons etc.;
- Messy eating and drinking;
- Speech and language difficulties;
- Poor sense of direction;
- Poor spatial awareness;
- Poor sequencing ability;
- Poor short-term memory;
- Difficulty in planning and organizing thought;
- Difficulty in holding a pen properly;
- Difficulty copying from the board;
- Poor writing and drawing abilities;
- Reading and spelling difficulties.

It is important to note that a child with dyspraxia may have a combination of several of these symptoms in varying degrees. By the time the dyspraxic child becomes older, an abnormality of behaviour becomes more apparent as more complex motor skills are required with matured activities. For example, learning to ride a bicycle may be a very difficult process, along with using cutlery, tying shoelaces and dressing up. A simple P.E. session could require a lot more exertion for the dyspraxic child. The older dyspraxic child also experiences poor balance, poor reading skills and poor handwriting. He tends to struggle with remembering instructions and copying



from the blackboard. Lastly, the child may encounter moderate to considerable difficulties with speech and expression.

### **Diagnosing Dyspraxia**

Parents, teachers, physicians, developmental and education psychologists, school counsellors, and indeed, everyone has a duty in the early identification of dyspraxia. Generally, the following hints provided by Dyspraxia Foundation (2013) may assist these professionals to spot out a child with dyspraxia:

In pre-school children, the child may exhibit the following characteristics:

- Late attainment of developmental milestones e.g. rolling over, sitting, standing, walking, and speaking
- Inability to run, hop, jump, catch or kick a ball although their peers can do so
- Difficulty in keeping friends due to an inability to behave appropriately in company
- Limited understanding of spatial concepts such as 'in', 'on', 'in front of', 'behind', etc
- Difficulty in walking up and down stairs
- Poor at dressing
- Slow and hesitant in most actions
- Appears not to be able to learn anything instinctively but must be taught skills
- Frequent stumbling and falling over
- Poor pencil grip
- Inability to do simple jigsaws or shape sorting games
- Artwork is very immature
- Often anxious and easily distracted

In school age children, the following characteristics may be observed:

- Probably has all the difficulties experienced by the pre-school child with dyspraxia, with little or no improvement
- Avoids PE and games
- Does badly in class but significantly better on a one-to-one basis
- Reacts to all stimuli without discrimination and attention span is poor
- May have trouble with mathematics and writing structured stories
- Experiences great difficulty in copying from the blackboard
- Writes laboriously and immaturely
- Unable to remember and /or follow instructions
- Is generally poorly organised

According to Gubbay (1978), diagnosis depends not on the severity of the motor disorder, but also on the demands of the environment, social acceptability, tolerance of errors, and on the child's ability to cope emotionally. So it may not become apparent until the impaired planning and execution systems are overtaxed. Actions which are learnt sufficiently well to become 'automatic' no longer involve praxis. Thus, a dyspraxic child among his peers doing familiar, learned things does not stand out as different, seems just the same as the others. It is only when new or unfamiliar tasks are involved that differences may become apparent, although, as a Dyspraxic child quickly learns techniques for covering his inabilities, even then it is not obvious

unless the observer knows what to look for. Different tests may be given by occupational therapists, speech therapists, teachers, psychologists, and paediatricians. As praxis affects many different functions of the body, complete assessment and evaluation is complicated. Basically it must - exclude other disorders, identify Dyspraxic signs and symptoms, according to age and stage of development, professionals examining the child should share findings to gain a whole, and more accurate, picture, on a team approach. Because dyspraxia may occur in isolation (with no other obvious abnormality), or as part (or a symptom of) another disorder, diagnosis can be complicated and difficult. Additional problems can include hyperactivity, learning difficulties, dyslexia, etc. Parents play a major role in assessment by highlighting the ways in which the disorder affects the child, themselves, and the family.

### **Implications for the Child, Family and School**

Each child shows a different set of symptoms, possibly in different areas - constructional, organizational, facial, ocular, verbal, and so on. As perceptual-motor abilities are central to all areas of development, its malfunction may affect a wide range of areas at home and at school, from life functions such as dressing or feeding oneself, to playing, reading, writing, or maths, and so on. Dyspraxia is a hidden handicap. If a person wears glasses, or a hearing aid, or a brace, it is immediately obvious that he or she has a disability, and allowances are made. The dyspraxic child appears just like any other until learned skills are taken out of context or new skills tried, when difficulties become apparent. It affects all areas of development thus:-

### **Physical Implications**

The child may well be able to perform a task or skill, but unable to plan the sequence of actions in order to do it. He is quite capable of doing everything appropriate to his stage of development, but e.g. pulling a chair to the right place at the table in order to sit and do a drawing, requires planning which for the child, although he could do it yesterday, may today be too difficult, 'lost in his system'; and so with all planned, deliberate actions, from eating with utensils and dressing himself, to talking, drawing, or manipulating a puzzle. He may be accident prone, clumsy, and lacking in co-ordination. He may look awkward when walking, running, climbing, slow to learn to ride a trike (tricycle), walk, manage steps, put on his clothes, or clean his teeth. He may have difficulty with eating and swallowing, be a messy eater, be very fussy about food textures. He may have difficulty gaining control over bladder and bowels. He may find it hard to organize his body parts, e.g. when sitting at a desk, or have a poor body image and be unable to identify the parts of his body with his eyes closed. He may seem threatened by new or unfamiliar physical tasks, and be reluctant to try them, thus at school Physical Education may be a problem. He may avoid trying new things or activities which are too hard. Poor fine motor skills may mean poor handwriting or drawing, or a dislike of puzzles.

### **Intellectual Implications**

The child usually has 'normal' intellect - is as intelligent as he would have been without dyspraxia - but may have difficulty in showing what he knows or integrating faultily stored sensory information to form concepts. Many children with dyspraxia are of above average intelligence, but have a low achievement rate. Without accurately stored sensory information, he may not be

able to form good concepts to help him make sense of the world. He may not easily be able to make choices (and may need to learn to do so), unable to follow a single (or set of) instructions, or to do so in the right sequence. He may seem easily distractible, seem to prefer activities suited to a younger age-group, may be slow learning new games and their rules. His memory may be excellent for some things, but unreliable; he may have a poor memory for either things heard or things seen. He may seem unable to plan an activity independently, may sometimes be heard saying "I'm bored!" He may avoid or be unable to play with things like Lego, blocks, play dough, etc., which all require much motor planning. He may be unable to play by himself, and have to learn to 'play'. Poor planning skills may mean that he needs constantly to know what is going to happen today, tonight, tomorrow, to plan ahead and repeat the plan often.

### **Emotional Implications**

An inability to cope with demands can lead to emotional difficulties, stress, frustration, anxiety, tension, and failure, with resulting low self-esteem, and possible behaviour problems. Without the reliable use of information from experience and his senses, judgment and awareness of others feelings, of his own feelings, and of situations may be impaired. He may have difficulty in balancing and centring himself emotionally. He is normal looking, so there may be unrealistically high expectations of him. Because he is less in control, he may become more demanding. He may show inappropriate emotions, or too much emotion, may be unable to understand or express his feelings or to moderate his interactions with others. Thus, a relatively small setback can be a tragedy of the first order, or an exciting event like a birthday or Christmas can make him physically ill with excitement. He may have difficulty adjusting to new situations - holidays, or a new class or teacher. Frustration and anxiety levels can be high, affecting all members of the family. His self-esteem is constantly at risk. Frustration, anxiety and tension may all too frequently be a problem.

### **Social Implications**

Without the consistent ability to 'read' people, situations, or the accepted behaviour in situations, friendships may be difficult, as his ability to moderate his behaviour, modulate his actions, or anticipate the results of his actions or behaviour (all highly developed cognitive skills either younger or older children rather than his peers, or sometimes prefer to play alone.

### **Language Implications**

Speech is the first consciously planned, voluntary motor skill, the most obvious of learned voluntary skills, and often the first disability to be noticed. The need to communicate is basic to our lives, and the inability to do so sometimes leads to an assumption that the intellect is also affected. It is not. The child may, however, have a very strong body-language. Dyspraxia may be a language problem because it impairs motor planning, which affects language production by affecting those muscles which control speech and the organization of language in the brain. Poor sequencing skills may affect the order of letters in words or words in a sentence, and unreliable word-finding skills make telling a story or relating an event difficult, laborious, and lengthy - or avoided! Many seem to present initially as a speech problem, with good comprehensive and poor expressive language. When the words do come, his speech may seem unclear; he may have

trouble getting sounds in words or words in sentences in the right order. He may find imitating sounds, whistling, or blowing balloons difficult. When relating a story he may seem to have trouble organizing his thoughts and relating events in order. He may have had trouble learning to feed or suck. He may read fluently to himself but not aloud. He may find it difficult to relate the letter symbol with the sound, and with the sound in the word and he may have great difficulty with spelling.

### **Sensory Implications**

He may have a poorly developed (or over-developed) sense of touch, or a poor auditory memory causing him to need things to be repeated frequently. His sense of balance may be affected, so he may avoid situations where it is challenged. He may have trouble with buttons or shoelaces, because of an inability to judge the positions of his body parts. He may have trouble blocking out extraneous sounds to hear particular ones, or finding one item in a pile. Incoming information may also not be moderated - the child may receive a vast flood of information instead of a steady flow, thus may be super-sensitive to touch; a supersensitive vestibular system may cause motion-sickness; crowds may distress him (though his distress may show in unexpected ways), etc.

School work may have its problems, even if not initially. Reading, writing, maths, all require a great deal of planning and organization. Difficulties may not appear until the demands of later stages of development show them up. Teachers may, find the child's ability to retain learning inconsistent, may find sequence in all areas, word-finding skills, communication, handwriting, reading (especially aloud), and following instructions all affected, making it difficult to gauge either what the child's intellectual potential might be, or how much information the child has retained or can recall. He or she will certainly need to discover the child's strengths and encourage these in order to maintain self- esteem.

Inconsistency means that a skill or ability today may be a disability tomorrow. This is not laziness - he simply can't. A perceived 'lack of concentration' may simply mean that his planning (or praxis) deserted him mid-task. He is an expert in covering his inabilities. Pressure makes it worse, not better. These children need to learn, would if they could, but - sometimes - can't.

They may become less articulate when they are upset or excited, and need to tell you what's wrong. They may be inarticulate when telling long stories, e.g. about what happened yesterday. Verbal sequence may be affected; the right word may be known but unable to be retrieved.

They may have difficulty in adjusting to new situations, things out of routine or out of context, new people, places, classes. They may be unable to spend a night away from home (e.g. school camps). They may need to plan for birthdays or Christmas for a whole year - and still not cope well. Having visitors, expected or not, may cause confusion and difficulties for him.

Because difficulties may show in one area and not others, it is sometimes hard for professionals who treat one area to see it as a 'global' thing, and not specific to their own field of expertise. It has been noted that there are different types of dyspraxia (verbal, motor, cognitive, etc.); a child may be affected in any or all areas at various stages of development, and to different degrees.

At home, life can be a challenge, both for the Dyspraxic child and for those around him. He may be incapable of being anything but noisy at times! The constant need for repetition of his own statements and questions, our answers and questions and for overt planning can be trying. He needs extra attention, which may cause contention among other family members. Dyspraxia

affects judgment in all sorts of issues, and may affect the ability to pick up on subtleties. Relationships between all family members carry extra strain. At some stage the child will need to understand the disorder, as will all family members.

### **Help for Dyspraxic Children—Current Directions**

The multiple nature of dyspraxia means that therapy necessarily covers many areas, and may include perceptual motor training (sensory integration therapy), speech and language therapy, maths and numeracy, reading and literacy, spelling, environmental manipulation, behaviour modification, and medication and treatment for any other disorders (American Academy of Pediatrics, 2012). The aim of treatment is to teach the child Praxis - to be able to form ideas of trying new things and familiar things in new ways - to plan the actions, and to execute them. It also focuses on the different stages of praxis, and helps it to develop following the developmental plan. Treatment should if possible be given with a team approach, each aspect tying in with the others holistically. The following are ways each member of the psychoacademic team may assist the dyspraxic child.

**Occupational Therapists:** May use a sensory integration tests to test and assess the child, and in treatment use sensory integrative based techniques, which reinforce and help to integrate information gathered by the senses, so that it can be stored and accurately retrieved as it is needed. It also helps the child to use action to gain and organize sensory information, and to use this information to plan and to achieve the intended action (Dawn, 2005).

**Speech and Language Therapists:** May help the child to gain control over the speech muscles, so that controlled sounds can be produced at will, to learn to plan language, to learn concepts with which to form strategies, and to use these strategies to make connections and to help form judgments (Dawn, 2005).

**Psychologists:** Assess cognitive development and learning ability and potential; and cognitive therapy aims to help the child to use the gathered and stored information to form concepts, which in turn help him to make sense of the world. Therapists also encourage fine motor skills with toys such as puzzles, etc.

**Remedial Teachers:** (Specific Learning Disorder teachers) can help a child, on a one- to-one basis, with specific problems - reading, spelling, maths, etc. This is often given in conjunction with specifically designed sensory integrative-based exercises, and using teaching methods suited to the individual child. The lessons should help the child retrieve learned information for use. Teacher-aides in the classroom, if obtainable, can help the child to achieve and to learn, working on a one-to-one basis. Brain Gym exercises with their cross-lateral element, can help the child integrate messages between the hemispheres of the brain (Koester, 1998; 2010; Brain Gym International, 2011).

**A Developmental Optometrist:** Will identify problems with control over eye muscles and eye tracking difficulties, and give exercises to help. A child with eye-tracking difficulties will have

problems e.g. in copying from the blackboard or a book (American Optometric Association, 2008).

**The School Counsellor:** May be involved if behavioural, emotional or family difficulties are present. Classroom teachers need to understand Dyspraxia and the accompanying learning difficulties children with dyspraxia may experience. Both their expectations and their individual teaching method for that child may have to be adjusted and thus the school counsellor may find it needful to offer adjustment counselling and any other required services. The Counsellor may also collaborate with the Specialist Education Service and arrange a needs analysis. Subsequent upon the outcome of the analysis, they may arrange any extra help the child may be seen to need.

**Parents:** Play the major role in continuing daily treatment routines and exercises, as well as teaching self-care and life skills - dressing, cleaning teeth, washing, making the bed, etc. Regular re-assessment during on-going treatment, to check on progress and adjust the program as needed, should be given. Regular contact and discussion between teachers, therapists, and family, to coordinate treatment and teaching, is highly desirable. Above all others, the progress of the child who has Dyspraxia will reverse if he is pulled in too many different ways at once.

**Audiblox:** A system of cognitive exercises aimed at the development of foundational learning skills—may also be utilised. Audiblox program is highly recommended for children who suffer from dyspraxia. This program places emphasis on the deficits that cause dyspraxia symptoms, i.e. deficits in spatial awareness, sense of direction, sequencing, short-term memory, fine and gross motor coordination, sensory motor integration, and language ([www.audiblox2000.com](http://www.audiblox2000.com); [www.edublox.com](http://www.edublox.com)).

### **Conclusion and Recommendations**

Developmental dyspraxia, as shown in this review, can impair learning enormously and if not well handled could lead to the development of secondary disorders or maladjustment with psychological, sociological, and physical manifestations. The onus therefore lies on psycho-academics (remedial teachers, psychologists, counsellors, and physicians) in the school system to identify, diagnose and handle this problem at the early stage of development.

School counsellors should, especially, be aware of the incidence and implications of dyspraxia, as it could seriously hamper the future vocational development of the children particularly in careers that emphasise praxis (motor coordination and efficiency). Such awareness will no doubt be useful when designing and implementing programmes of career guidance and counselling in the school system. Dyspraxic children may thus be helped through a tailor-made programme of career education to pursue and adjust to careers that are within their limited motor efficiency levels and thus self-actualise.

As has been indicated, the main aim of psycho-academic intervention is to help the child circumnavigate his difficulties, to learn and to achieve his potential. Without the appropriate help at the right time, the possibility exists of him growing into an extremely frustrated and probably unemployable adult. However, given early therapy and help the child can learn, achieve, and



eventually become a happy, satisfied, useful adult. There are those in many highly responsible positions throughout modern societies who have achieved their ambitions and work successfully within their particular fields of interest, in spite of their dyspraxia; equally, there are those who, having not received early help, are a constant drain on communal welfare and penal systems, and live constantly with frustration.

The bottom line is that dyspraxic children are normal, bright, lovable, intelligent children who have difficulty planning and organizing appropriate actions or behaviour. The understanding and help of all who deal with them is an essential part of their learning process. A child with developmental dyspraxia is not dumb, not stupid, not lazy, and certainly not un-cooperative as often perceived.

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